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| 09/692,681 | 10/18/2000 | Hui Liu | 005158.P003 | 5639 |

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| EXAMINER | |
|---|---|
| MOLINARI, MICHAEL J | |
| **ART UNIT** | **PAPER NUMBER** |
| 2665 | 9 |

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Please find below and/or attached an Office communication concerning this application or proceeding.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 09/692,681 | LIU ET AL. | |
| | Examiner | Art Unit | |
| | Michael J Molinari | 2665 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *26 January 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-27* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-22 and 27* is/are rejected.

7)☒ Claim(s) *23-26* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *18 March 2002* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *3, 6-8*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

## DETAILED ACTION

### *Claim Rejections - 35 USC § 112*

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claim 1 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 1 recites the limitation "the base station" in line 2. There is insufficient antecedent basis for this limitation in the claim.

3. Claim 6 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The claim does not state from which claim it depends (see line 1).

4. Claim 12 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 12 recites the limitation "the OFMA channels" in line 2. There is insufficient antecedent basis for this limitation in the claim.

### *Claim Rejections - 35 USC § 103*

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 1-12, 15, 21, 22, and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yun et al. (U.S. Patent No. 5,886,988) in view of Alamouti et al. (U.S. Patent No. 5,933,421).

7. Referring to claim 1, disclose a network comprising: a plurality of subscriber units (see Figure 1, #20, #22, #24) to communicate with the base station (see Figure 1, #100) using an SDMA protocol (see column 2, line 30); and a base station (see Figure 1, #100) including a memory (see Figure 1, #48) to store broadband spatial signature vectors associated with each subscriber (see column 2, lines 43-54), the vectors being a function of frequency (see column 2, lines 43-54. column 8, lines 64-67, column 9, lines 1-17); and traffic channel allocation logic (see Figure 1, #48) to allocate channels using the broadband spatial signature vectors of the subscribers (see column 2, lines 43-54). Yun et al. teach the use of an FDMA protocol (see column 1, lines 15-22, column 2, lines 19-23, and column 3, lines 13-15) but differ from claim 1 in that they fail to disclose that the communication uses an OFDMA protocol. However, it is well known in the art that OFDMA protocols are an improvement on FDMA protocols. For example, Alamouti et al. teach the use of OFDMA protocols instead of FDMA protocols (see column 2, lines 65-67 and column 3, lines 1-24), which has the advantage of reducing interference between the carrier channels. One skilled in the art would have recognized the advantage of using OFDMA as taught by Alamouti et al. Therefore, it would have been obvious to a person with ordinary skill in the art at the time of the invention to incorporate the use of OFDMA as taught by Alamouti et al. into the invention of Yun et al. to achieve the advantage of reducing interference between the carrier channels.

8. Referring to claim 2, Yun et al. disclose that the broadband spatial signature vectors are indicative of fading and spatial characteristics of the subscribers (see column 2, lines 8-14).

9. Referring to claim 3, Yun et al. disclose that at least one of the spatial signature vectors is indicative of channel fading conditions of a new subscriber at all OFDMA traffic channels (see column 2, lines 8-14 and 41-54).

10. Referring to claim 4, Yun et al. disclose data rate storage for storing information indicative of the data rate of on-going traffic (see column 4, lines 65-67 and column 5, lines 1-25).

11. Referring to claim 5, Yun et al. disclose a method comprising: determining frequency and spatial characteristics of a plurality of channels for a new subscriber and one or more subscribers with on-going traffic (see column 2, lines 41-54); allocating a subscriber one or more channels based on on-going traffic among the channels (see column 2, lines 41-54). Yun et al. teach the use of an FDMA protocol (see column 1, lines 15-22, column 2, lines 19-23, and column 3, lines 13-15) but differ from claim 5 in that they fail to disclose that the communication uses an OFDMA protocol. However, it is well known in the art that OFDMA protocols are an improvement on FDMA protocols. For example, Alamouti et al. teach the use of OFDMA protocols instead of FDMA protocols (see column 2, lines 65-67 and column 3, lines 1-24), which has the advantage of reducing interference between the carrier channels. One skilled in the art would have recognized the advantage of using OFDMA as taught by Alamouti et al. Therefore, it would have been obvious to a person with ordinary skill in the art at the time of the invention to incorporate the use of OFDMA as taught by Alamouti et al. into the invention of Yun et al. to achieve the advantage of reducing interference between the carrier channels.

12. Referring to claim 6, Yun et al. disclose assigning traffic channels to multiple access subscribers based on broadband channel characteristics, wherein the broadband channel characteristics comprise space and frequency characteristics (see column 2, lines 41-54).

13. Referring to claim 7, Yun et al. disclose a method comprising: estimating spatial and frequency characteristics of propagation channels using a FFT-based or parametric channel estimation algorithm between a base station and a new subscriber (see column 2, lines 41-54, column 4, lines 65-67, and column 5, lines 1-25; see also Figure 3a, #303, #304, and #305); accommodating a rate request of the new subscriber by assigning traffic channels that use a first amount of transmission power and cause a second amount of interference to co-channel subscribers (see column 2, lines 41-54). Yun et al. teach the use of an FDMA protocol (see column 1, lines 15-22, column 2, lines 19-23, and column 3, lines 13-15) but differ from claim 7 in that they fail to disclose that the communication uses an OFDMA protocol. However, it is well known in the art that OFDMA protocols are an improvement on FDMA protocols. For example, Alamouti et al. teach the use of OFDMA protocols instead of FDMA protocols (see column 2, lines 65-67 and column 3, lines 1-24), which has the advantage of reducing interference between the carrier channels. One skilled in the art would have recognized the advantage of using OFDMA as taught by Alamouti et al. Therefore, it would have been obvious to a person with ordinary skill in the art at the time of the invention to incorporate the use of OFDMA as taught by Alamouti et al. into the invention of Yun et al. to achieve the advantage of reducing interference between the carrier channels.

14. Referring to claim 8, Yun et al. disclose that estimating characteristics of propagation channels is performed using a FFT-based or parametric channel estimation algorithm (see Figure 3a, #303, #304, #305, see also claim 19).

15. Referring to claim 9, Yun et al. disclose that the first amount comprises a minimum amount of transmission power as compared to other channels not assigned to the new subscriber (column 9, lines 65-67, column 10, lines 1-6 and 63-67 and column 11, lines 1-17).

16. Referring to claim 10, Yun et al. disclose that the second amount comprises the least amount of interference caused to co-channel subscribers in comparison to interference caused to one or more subscribers if using one or more of the OFDMA traffic channels that are not assigned to the new subscriber (column 9, lines 65-67, column 10, lines 1-6 and 63-67 and column 11, lines 1-17).

17. Referring to claim 11, Yun et al. disclose that estimating spatial and frequency characteristics comprise estimating a spatial signature of the new subscriber over a predetermined number of channels (see column 10, lines 1-6 and 63-67 and column 11, lines 1-17).

18. Referring to claim 12, Yun et al. disclose that the predetermined number of channels comprises all of the channels (see column 10, lines 1-6 and 63-67 and column 11, lines 1-17).

19. Referring to claim 15, Yun et al. disclose assigning, to the new subscriber, OFDMA traffic channels with the highest achievable rates and least effect on other subscribers with on-going traffic over some portion of the channels (see column 2, lines 41-54, column 9, lines 65-67, column 10, lines 1-6 and 63-67 and column 11, lines 1-17).

20. Referring to claim 21, Yun et al. disclose a base station (see Figure 1, #100) comprising: a plurality of receiving antennas (see Figure 1, #19); a plurality of down converters coupled to the plurality of receiving antennas (see Figure 1, #62, #66); a new accessing subscriber spatial signature register (see Figure 1, #48; see column 2, lines 41-54); an on-going traffic spatial signature register (see Figure 1, #48; see column 2, lines 41-54); and an FDMA traffic channel allocator coupled to the new accessing subscriber spatial signature register and the on-going traffic spatial signature register (see Figure 1, #48; see column 2, lines 41-54 and see column 4, lines 65-67 and column 5, lines 1-25). Yun et al. teach the use of an FDMA protocol (see column 1, lines 15-22, column 2, lines 19-23, and column 3, lines 13-15) but differ from claim 21 in that they fail to disclose that the communication uses an OFDMA protocol. However, it is well known in the art that OFDMA protocols are an improvement on FDMA protocols. For example, Alamouti et al. teach the use of OFDMA protocols instead of FDMA protocols (see column 2, lines 65-67 and column 3, lines 1-24), which has the advantage of reducing interference between the carrier channels. One skilled in the art would have recognized the advantage of using OFDMA as taught by Alamouti et al. Therefore, it would have been obvious to a person with ordinary skill in the art at the time of the invention to incorporate the use of OFDMA as taught by Alamouti et al. into the invention of Yun et al. to achieve the advantage of reducing interference between the carrier channels.

21. Referring to claim 22, Yun et al. disclose that the channel allocation logic allocates FDMA channels to a new subscriber based on information from the new subscriber spatial signature register and the on-going traffic spatial signature register (see column 8, lines 64-67 and column 9, lines 1-17).

22. Referring to claim 27, Yun et al. disclose an FDMA medium access control (MAC) logic coupled to the channel allocator (see Figure 1, #48); an FDM modulator coupled to the FDMA MAC logic (see Figure 1, #52); a plurality of parallel narrowband beamformers coupled to the FDM modulation (see Figure 1, #70 and #42); a plurality of upconverters coupled to the plurality of beamformers (); and a plurality of transmitting antennas coupled to the plurality of upconverters (see Figure 1, #19).

23. Claims 13 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yun et al. in view of Alamouti et al. as applied to claim 7 above, and further in view of Wallace et al. (U.S. Patent No. 6,473,467).

24. Referring to claim 13, Yun et al. differ from claim 13 in that they fail to disclose determining an achievable rate of the new subscriber over each of the OFDMA channels with a presence of on-going subscribers. However, it is well known in the art to determine an achievable rate for a new subscriber over each OFDMA channels. For example, Wallace et al. teach determining achievable rates for new subscribers over OFDMA channels (see column 27, lines 62-67 and column 28, lines 1-13), which has the advantage of enabling the system to allocate the proper number of channels to meet the requirements of the subscriber. One skilled in the art would have recognized the advantage of determining achievable rates for new subscribers over OFDMA channels as taught by Wallace et al. Therefore, it would have been obvious to a person with ordinary skill in the art at the time of the invention to incorporate determining achievable rates for new subscribers over OFDMA channels as taught by Wallace et al. into the invention of Yun et al. in view of Alamouti et al. to achieve the advantage of enabling the system to allocate the proper number of channels to meet the requirements of the subscriber.

25. Referring to claim 14, Wallace et al. disclose that determining the achievable rate is performed using spatial characteristics of on-going traffic and a spatial signature of the new subscriber over all of the OFDMA traffic channels (see column 27, lines 62-67 and column 28, lines 1-13).

26. Claims 16-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yun et al. (U.S. Patent No. 5,886,988) in view of Alamouti et al. (U.S. Patent No. 5,933,421), further in view of Wallace et al. (U.S. Patent No. 6,473,467).

27. Referring to claim 16, Yun et al. disclose a method of assigning frequency-division multiple-access (FDMA) traffic channels in conjunction with a space-division multiple access (SDMA) protocol comprising (see column 2, lines 19-23): estimating broadband spatial and frequency channel characteristics of a requesting subscriber (see column 2, lines 41-54). Yun et al. teach the use of an FDMA protocol (see column 1, lines 15-22, column 2, lines 19-23, and column 3, lines 13-15) but differ from claim 16 in that they fail to disclose that the communication uses an OFDMA protocol. However, it is well known in the art that OFDMA protocols are an improvement on FDMA protocols. For example, Alamouti et al. teach the use of OFDMA protocols instead of FDMA protocols (see column 2, lines 65-67 and column 3, lines 1-24), which has the advantage of reducing interference between the carrier channels. One skilled in the art would have recognized the advantage of using OFDMA as taught by Alamouti et al. Therefore, it would have been obvious to a person with ordinary skill in the art at the time of the invention to incorporate the use of OFDMA as taught by Alamouti et al. into the invention of Yun et al. to achieve the advantage of reducing interference between the carrier channels. Yun et al. further differ from claim 16 in that they fail to disclose determining, for each of the

FDMA traffic channels, an achievable rate of the requesting subscriber over each of the FDMA traffic channels; calculating, for each of the FDMA traffic channels, a new achievable rate of at least one other subscriber with on-going traffic on one or more of the FDMA traffic channels if the at least one other subscriber is to share the one or more FDMA traffic channels with the requesting subscriber; determining candidate traffic channels; and allocating candidate traffic channels to the requesting subscriber unit to satisfy the requested data rate. However, such a method is well known in the art. For example, Wallace et al. teach such a method (see column 27, lines 62-67 and column 28, lines 1-13), which has the advantage of enabling the system to allocate the proper number of channels to meet the requirements of the subscriber. One skilled in the art would have recognized the advantage of the method of calculating and using achievable data rates as taught by Wallace et al. Therefore, it would have been obvious to a person with ordinary skill in the art at the time of the invention to incorporate the calculation and use of achievable data rates as taught by Wallace et al. to achieve the advantage of enabling the system to allocate the proper number of channels to meet the requirements of the subscriber.

28. Referring to claim 17, Wallace et al. disclose that determining the achievable rate of the requesting subscriber comprises using single-user detection or multi-user detection (see column 27, lines 62-67 and column 28, lines 1-13).

29. Referring to claim 18, Wallace et al. disclose that performing spatial multiplexing includes performing single-user beamforming and multi-user beamforming (see column 4, lines 48-63).

30. Referring to claim 19, Yun et al. disclose that allocating candidate traffic channels comprises performing channel allocation based on reducing resource usage while satisfying the QoS requirements of the subscriber (see column 4, lines 65-67 and column 5, lines 1-25).

31. Referring to claim 20, Yun et al. disclose that performing channel allocation is based on minimizing the resource usage (see column 4, lines 65-67 and column 5, lines 1-25).

### *Allowable Subject Matter*

32. Claims 23-26 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

### *Conclusion*

33. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

34. U.S. Patent No. 6,449,246 to Barton et al. teaches a method of calculating achievable data rate in an OFDM system.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael J Molinari whose telephone number is (703) 305-5742. The examiner can normally be reached on Monday-Thursday 8am-6:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Huy Vu can be reached on (703) 308-6602. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Michael Joseph Molinari

ALPUS H. HSU
PRIMARY EXAMINER